

## ABSTRACT

This invention relates generally to a method for controlling the pore size, pore size distribution and porosity of aluminum-oxide based ceramics through the choice of substituents on carboxylate-alumoxanes and aluminum-oxide nanoparticles. The method allows for the formation of intra-granular pores in the nanometer range to be created in alumina and aluminum oxide ceramic bodies. The control over pore size and pore size distribution is accomplished through the use of different chemical substituents on the carboxylate-alumoxanes and aluminum-oxide nanoparticles. The size and distribution of pores within the alumina-oxide ceramic are dependent on the identity of the carboxylate substituents. In particular the formation of intra- versus inter-granular porosity is dependent on the identity of the carboxylate substituents. The invention also provides methods for the manufacture of ceramic coatings on ceramic and carbon fibers for composite applications and ceramic membranes with nanometer sized pores. The pore size, pore size distribution and porosity, and hence the strength, permeability and surface adhesion, of the ceramic coating is controlled by the choice of substituent on the carboxylate-alumoxane. Thermolysis of self supporting spun layers of the carboxylate-alumoxanes results in disks of alumina with controlled pore size, pore size distribution and porosity. In an alternative method a porous substrate is dipped or coated with a solution of the carboxylate-alumoxane, followed by thermolysis to produce a composite membrane.